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February 12, 1996

Secretary
Federal Communications Commission
Washington, D.C. 20554

Re: CC Docket 94-102, PBX and wireless E9-1-1 compatibility

Dear Mr. Secretary:

Submitted herewith for placement on the record of the captioned proceeding, pursuant to Section 1.1206 of the Rules, are an original and one copy of "Public Safety-Wireless Industry Consensus: Wireless Compatibility Issues, CC Docket 94-102."

The document was discussed with Dan Grosh and other members of the staff of the Wireless Telecommunications Bureau at a meeting today with representatives of the parties to the consensus: NENA, APCO, NASNA and CTIA. Please direct any questions to one of the undersigned.

Sincerely,

James R. Hobson, Counsel for NENA
Robert Gurss, Counsel for APCO
Michael Altschul, General Counsel, CTIA

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Public Safety-Wireless Industry Consensus Statement on Wireless Compatibility Issues, CC Docket 94-102

At the invitation of the Cellular Telecommunications Industry Association (CTIA), representatives of three public safety communications organizations met with CTIA officials during November and December 1995 to examine possible areas of agreement on the wireless compatibilty issues in CC Docket 94-102. The public safety organizations,

National Emergency Number Association (NENA),

Association of Public-Safety Communications Officials (APCO), and

National Association of State Nine One One Administrators (NASNA),

have participated jointly in the docket through comments and reply comments. The following consensus statement covers issues on which substantial agreement was reached. Where minor differences remain, these are identified.

The use of the terms "Wireless Industry" and "Public Safety Communicators" (PSCs) reflects the optimism of the four organizations -- CTIA, NENA, APCO and NASNA -- that their consensus constitutes a viable basis for commitment by other industry and public safety associations.

Automatic number identification (ANI)
and automatic location information (ALI)

1. The Wireless Industry will move immediately[1] to "Phase I" E9-1-1, the provision of cell site information using a 7 or 10-digit pseudo-ANI and a 7 or 10-digit caller ANI (*i.e.* calling party number), depending on the local landline network's signaling capability.

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[1] CTIA believes 18 months from the FCC's adoption of rules is a realistic frame for implementation of Phase I. The PSCs prefer the 12 months suggested in the Notice of Proposed Rulemaking.

2. The Wireless Industry and the Public Safety Communicators will abandon the FCC's proposed "Phase II" (3-year) radiolocation objective[2] as not meeting the needs of the industry for a bridge to "Phase III" capability or of the 9-1-1 community for reliable location information.[3]

3. The Wireless Industry will achieve, during new Phase II -- no longer than 5 years from the FCC's adoption of rules -- the ability to locate, in latitude and longitude,[4] a wireless caller within 125 meters Root Mean Square (RMS).[5]

Comment. The use of a "probability" of location within a stated area is a reflection of the Wireless Industry's concern that no terrestrial ALI technique now envisioned will be able to perform to the 125-meter tolerance 100% of the time. The "bell curve" distribution of differences between true and estimated position is illustrated by Exhibit 2, reflecting actual results measured by Associated Group, a vendor-participant in Docket 94-102, for trials conducted in Rochester, Philadelphia and Baltimore. The "tail" of the curve at the right edge of the graph demonstrates that some relatively small number of estimates will be off by more than 500 feet (152.4 meters).

In the Associated Group trials, the RMS distance turned out to be 375 feet, or 114 meters. According to a company spokesman familiar with the tests, this level of accuracy was achieved 70-75% of the time. If the curve plotted from the results were "normal" (Gaussian), statistical theory holds that RMS distance would represent 63 to 68% probability of containment within an area around true position -- depending on whether the area were more nearly circular or elliptical.[6] Thus, roughly speaking, to prescribe "125 meters RMS" is to

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2 The FCC proposed that, 3 years after adoption of rules, "the ALI information provided to the PSAP must include an estimate of the approximate location and the distance of the mobile unit from the receiving base station or cell site . . ." (Notice, ¶50)

3 The PSCs wish to emphasize that their abandonment of a 3-year intermediate deadline should not be taken to mean that no ALI improvements can or should be expected between Phase I and new Phase II (5 years from adoption of rules). To the contrary, the PSCs believe some vendors can meet now the new Phase II requirement discussed below, and that others will achieve this level of performance well in advance of 5 years.

4 The dimension of altitude, or height above some ground reference, is not a part of this proposed requirement.

5 The mathematical expression for RMS is found at Exhibit 1 hereto.

6 This is illustrated by Exhibit 3, prepared by Dr. John Maloney of KSI, another vendor-participant in the docket.

require that degree of ALI accuracy from two-thirds to three-fourths of the time.[7]

4. The PSCs acknowledge the additional concern of the Wireless Industry that in exceptional cases -- which may represent entire serving areas or "pockets" within serving areas[8] -- the 125-meter RMS standard may be difficult or impossible to meet. The parties have agreed to work on this in good faith as an "implementation issue" which need not delay the adoption of the general rule.

Financial and legal liability

1. In moving to Phase II, a cost recovery mechanism is needed to fund both carrier (wireless and wireline) and PSAP investment in E9-1-1 technology and 9-1-1 cost of service.[9] This could be in the form of public appropriations or bond issues, with or without a separate 9-1-1 subscriber line fee (*e.g.* 75 cents a month), which carriers would be compensated at customary rates to collect.[10]

Comment. The parties agree, and would ask the FCC to declare, that state or local 9-1-1 fees or taxes reasonably related to recovery of prudently-incurred wireless system or service costs are not barred as a matter of law. They also agree, and would ask the FCC to state, that such fees or taxes should not discriminate between wireline and wireless carriers involved in delivery of 9-1-1

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7 This range appears to represent the variance of the real from the theoretical, as discussed in the letter of January 3, 1996 from Louis Stilp of Associated Group to Bob Miller, Chair of the NENA Technical Issues Committee. (Exhibit 4)

8 Rural or other thinly-populated areas may have system configurations which, without augmentation at special expense, would not deliver accurate ALI. Similarly, pockets obstructed by natural or artificial barriers might not be amenable to the techniques used to deliver ALI successfully in most of the serving area. In addition, carriers already have deployed, or will deploy, technologies for which there is no commercially available ALI solution. For example, no means now exists to provide ALI in tunnels where carriers must use coaxial cable ("leaky coax") antennas to provide wireless service.

9 The Wireless Industry has indicated that the relatively small additional expense involved in Phase I would not require advance adoption of public funding mechanisms.

10 These examples are not meant to be prescriptive or exhaustive. The variety of state funding methods associated with wireline 9-1-1 and E9-1-1 is illustrated by a table and associated materials placed on the record of Docket 94-102 by the PSCs, pursuant to Section 1.1206 of the Rules, on October 11, 1995.

services. The parties agree to work in good faith toward the adoption of state and local legislation fairly designed for cost recovery under these principles.

2. The FCC should address and resolve carrier and PSAP legal liability issues.

Comment. The parties believe that the wireline experience, in which callers generally have been held to consent implicitly to the disclosure of calling number, location and associated information, is applicable to wireless 9-1-1 communications. Similarly, PSAP and wireline experience with state "Good Samaritan" statutes is applicable to wireless 9-1-1 communications.

3. Specifically, the FCC should address and resolve whether the constraints on disclosure of information to law enforcement officials in Section 103(a)(2)(B) of P.L. 103-414, the Communications Assistance for Law Enforcement Act of 1994, affect 9-1-1 operations and legal liability.

Comment. The parties believe that, despite the 1994 act's express language barring caller location disclosure (except where "determined from the telephone number"), Congress did not intend to preclude location determination and disclosure via other means (such as ALI), in the ordinary course of good-faith 9-1-1 operations.

Selected additional issues

Access by speech/hearing-impaired callers (NPRM ¶54). The FCC proposed a Phase I requirement that 9-1-1 access be available to speech- and hearing-impaired individuals through means other than voice-only mobile radio handsets, such as text telephone (TTY) devices. The parties agree.

Re-ring/callback (¶52). The FCC proposed to require, at Phase II (3 years from order), that "wireless systems must provide PSAP attendants with the capability to call back the 911 caller if the call is disconnected," so long as "the mobile user has not turned off the mobile unit." The parties agree to an earlier adoption.

Comment. The parties acknowledged that the Wireless Industry's agreement to provide ANI and pseudo-ANI in Phase I (see above) will make it possible for the PSAP to dial back a 9-1-1 caller under the indicated

circumstances. They also agreed that the "automatic re-ring" features of the wireline network need not be required at this point.

9-1-1 availability (¶41). The FCC proposed as a Phase I requirement that a caller "have the ability to reach emergency services from any service initialized mobile radio handset in a home service area or a subscribed-to roamed service area by dialing only 911." The NPRM explained that service initialization means a "user has purchased services from a wireless service provider," and that 9-1-1 is to be available "without a requirement for user validation." The parties agree.

Equipment labeling (¶55). The FCC was less firm with its proposals in this area, partly owing to uncertainty about the extent to which wireless compatibility would be a function of subscriber equipment versus network infrastructure and features. It suggested a warning that might be placed on both phones and outside packaging, simply stating that location and callback number might not be automatically known to the PSAP taking the 9-1-1 call.

Comment. Acknowledging that wireless compatibility, at least with respect to cellular telephony, is likely to proceed on a network implementation basis in the near term, the parties agreed to work on methods and language for consumer education that would not depend on equipment labeling.

February 1996

CELLULAR TELECOMMUNICATIONS INDUSTRY ASSOCIATION
NATIONAL EMERGENCY NUMBER ASSOCIATION
ASSOCIATED PUBLIC-SAFETY COMMUNICATIONS OFFICIALS--INTERNATIONAL
NATIONAL ASSOCIATION OF STATE NINE ONE ONE ADMINISTRATORS

Exhibit 1

$$RMS = \sqrt{\sum_{i=1}^{i=n} \frac{(X_a - X_{ei})^2 + (Y_a - Y_{ei})^2}{n}}$$

where a = 2-dimensional actual location in X (longitude) and Y (latitude),

ei = 2-dimensional estimated location in X and Y, and

a - ei = linear error between actual and estimated location.

Exhibit 2

Predicted Results For Production System

- ▲ Gaussian (Normal) Distribution With Tail
- ▲ Results Measured Over Hundreds Of Points
- ▲ 250 Feet Average Error
- ▲ 375 Feet RMS Error
- ▲ 500 Feet At 90% Point

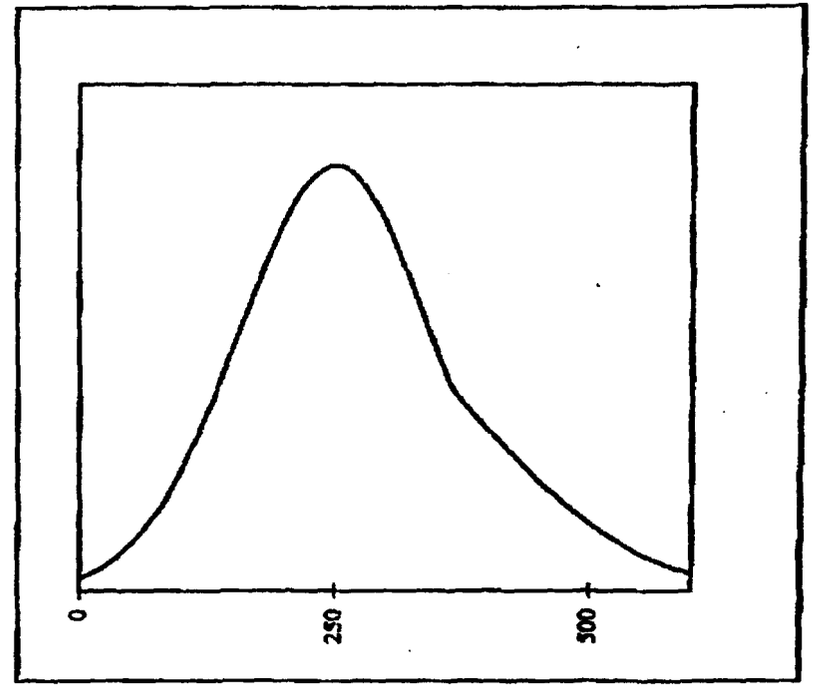


Exhibit 3

KSI®

4 January 1996

Mr. James R. Hobson
Attorney at Law
Donelan, Cleary, Wood & Maser, P.C.
Suite 750
1100 New York Avenue, N.W.
Washington, DC 20005

Dear Jim,

In accord with your request, we are herein providing graphical representations that depict the meaning of normal probability relations and the different probability expectations that arise with the use of the "rms" parameter in two dimensions. These relations will be a integral part of the location estimation process for E-9-1-1.

I spoke with Lou Stilp, when he called yesterday, and he now agrees, after talking with his scientists, that unbiased, normal position distributions will only produce 63% containment within the "rms circle" when the uncertainty regions are circular. He seems to feel that the uncertainty regions which he usually obtains are circular, but he says that his data usually provide rms-containment percentages "in the low 70s." I noted that this implies his particular system implementation is producing non-normal (or biased) distributions.

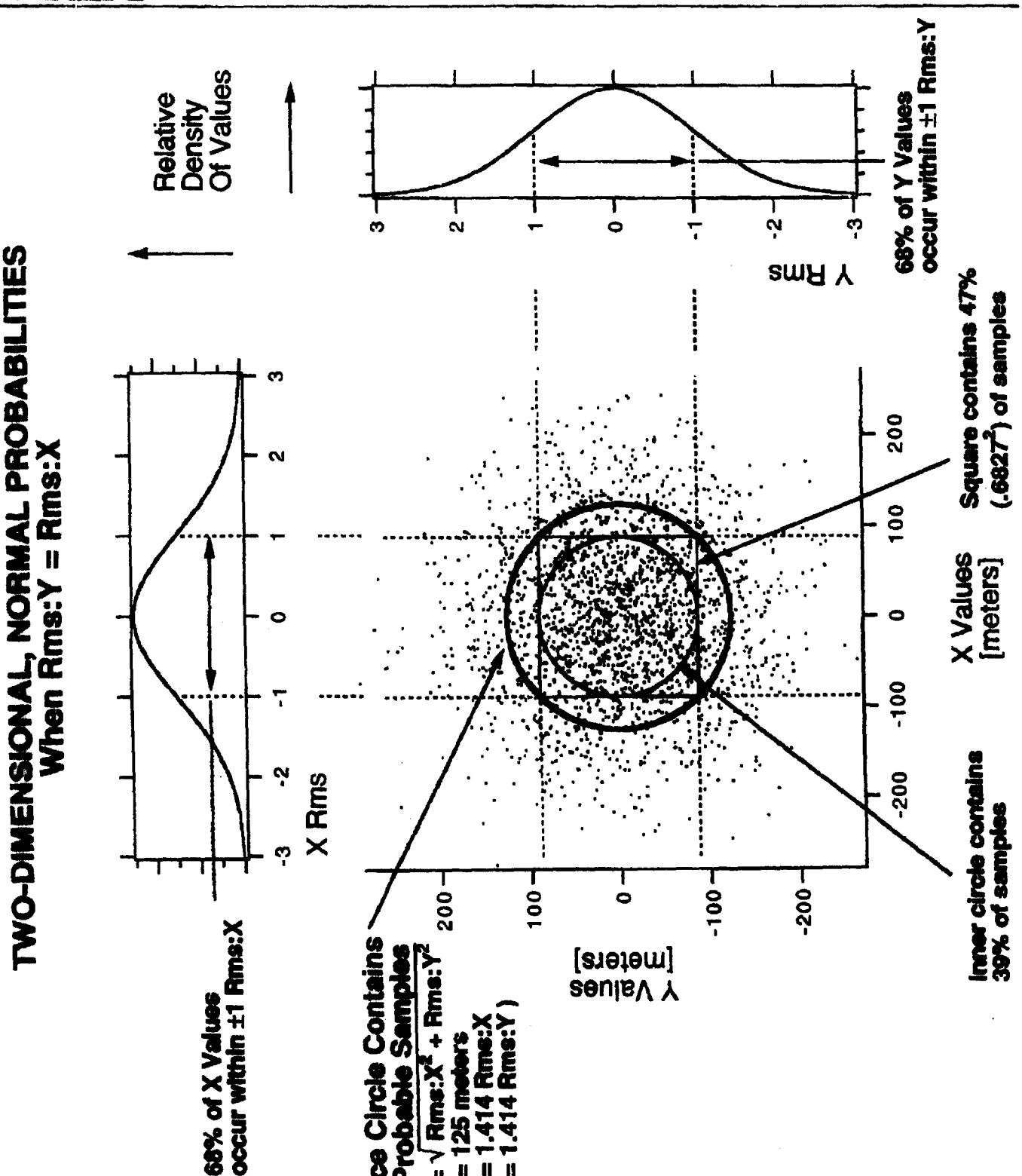
I apologize for the extra week needed to provide these pictures to you. With the holiday vacation schedule and with the time required to develop the material, I couldn't get this information to you sooner.

Please let me or Chuck Hinkle know whether this meets your needs and whether you have any further questions.

Respectfully Yours,

John E. Maloney, Ph.D.
Executive Vice President

KSI®



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TWO-DIMENSIONAL, NORMAL PROBABILITIES
When Rms:Y = 1/3 Rms:X

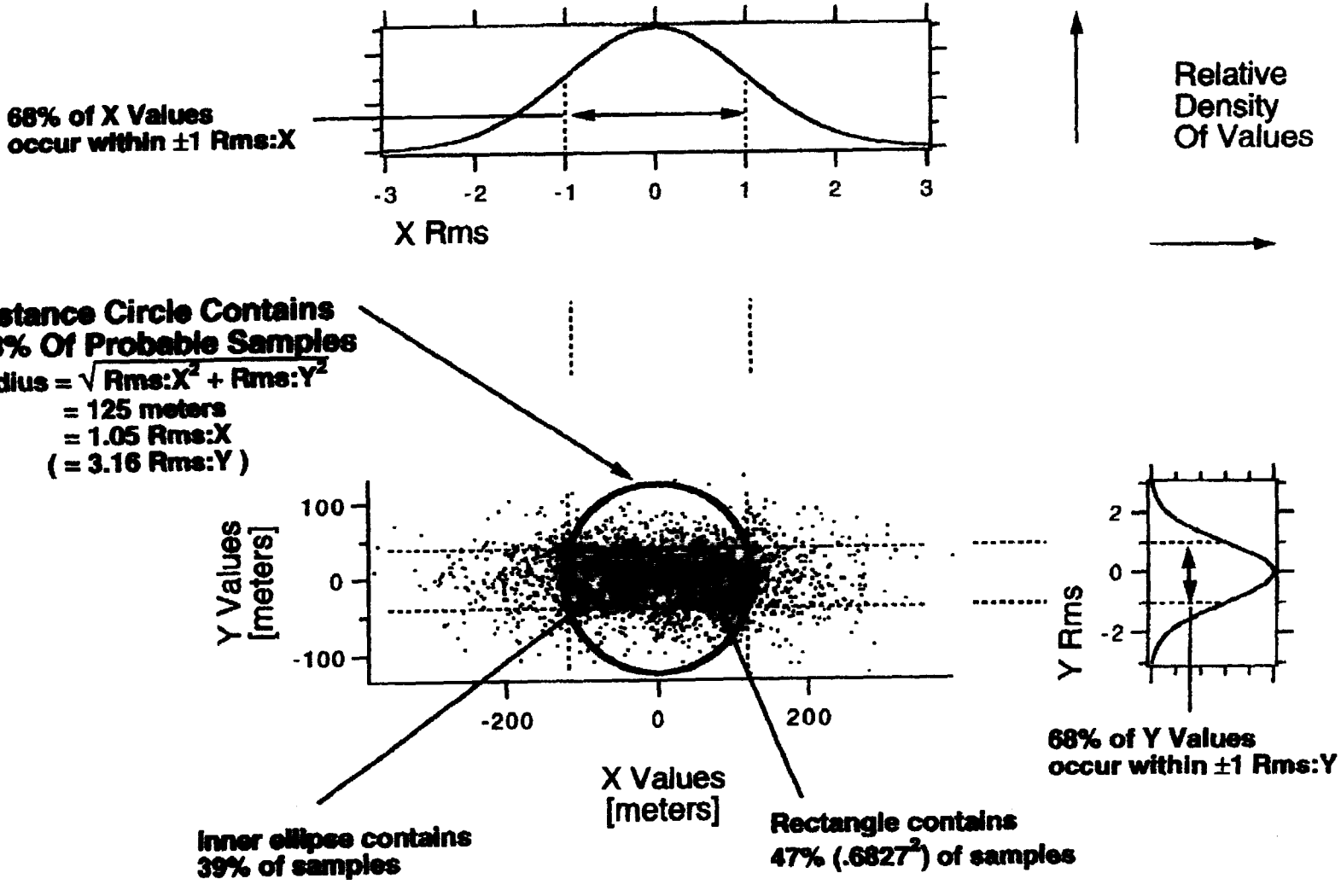

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Exhibit 4

January 3, 1996

Mr. Bob Miller
Director, 911
Office of Emergency Telecommunications Systems
State Of New Jersey

Dear Bob,

I followed up on your request to investigate the issue of what "RMS" is likely to mean in terms of the percentage of locations that fall within the "RMS" boundary. Two different statistical models have been suggested: a Rayleigh distribution as suggested by John Maloney of KSI and a Gaussian distribution with a tail as suggested by Associated. I discussed the issue length with Associated's scientists, and also with John yesterday.

A Rayleigh distribution is formed when two one-dimensional Gaussian distributions are combined in two dimensions. Thus, in a location system, if the error in latitude were purely Gaussian distributed and the error in longitude were also purely Gaussian distributed, then the mathematics would predict the radial error (combination of latitude error and longitude error) to be Rayleigh distributed. The RMS point in a pure Rayleigh distribution contains 63 percent of the points. Associated's scientists were in complete agreement with John on these points, and if one assumed that the real world followed mathematical theory, these results would be expected.

The disagreement between John and Associated lies in the actual observed data. Over the holidays, I had our scientists retrieve all of our data from the tests in Philadelphia, Baltimore, and Rochester. The error distribution for the data was grouped into days, weeks, and cities in various combinations to form various statistical samples. The profile of the data is never Gaussian and never Rayleigh, but rather something in between. We have always described it as "Gaussian with a tail", which in fact has no mathematical representation in the textbooks, but rather implies a general look to it. We have used it as part of out presentations since 1993, and it has never been contested.

With each of these data sets, the RMS point can be calculated only empirically (as opposed to theoretically), and the percentage of points contained with the RMS point can be easily measured. Our experience over thousands of data points, in three cities, over tens of square miles, with 3 different cellular carriers is that the RMS point generally falls within 70 to 75 percent. I asked John about KSI's real world experience with live data. John indicated that that KSI didn't have much field data and that he wouldn't quarrel with real field data. We both agreed that it's not surprising that the real world is neither purely Gaussian or purely Rayleigh. Many legitimate reasons can account for the deviation from pure mathematical theory.

John indicated that his point all along in our December 19th meeting was that a Rayleigh distribution had an RMS point of 63 percent. We clearly agreed with that statement. John seemed willing back off on what might be found in actual systems, mostly because he had no contrary data to counter Associated's extensive efforts. I hope that this letter closes the loop and answers all open issues from the 19th. If I can provide any further clarification, please call me at (610) 660-4910.

Yours very truly,

Louis A. Stilp